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PRODUCERS' PRICES FOR INDUSTRIAL GOODS

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I. INTRODUCTION

1. This paper will confine itself to the collection of data at producers' prices in the ISIC groups 2 and 3, namely mining and manufacturing and covering only the domestic producers. The paragraphs that follow are extracts from the "Manual on Producers' Price Indices for Industrial Goods" prepared by the United Nations Statistical Office. This manual is still under the process of production and will be circulated to all the statistical offices as soon as it has been completed. It describes how price statistics should be collected and processed to construct indices for groups of commodities and for the output of various mining and manufacturing activities.

2. For our purpose of discussion, the secretariat thought it better to extract the main sections of the manual that highlight the problems of data collection. These include selection and specification of items, selection of reporting units, and price observation. For more details covering a wide range of topics, refer to the manual as soon as available.

II. DEFINITION OF PRODUCERS' PRICES

3. This paper deals with the procedures which may be used to measure the prices at which producers in mining and manufacturing activities sell their output. "Producers' prices" differ from "purchasers' prices" because they exclude the trade margins and transport costs which may be incurred in delivering the output from the producer to the purchaser.

4. As used in this paper, the term "producers' prices" should not be confused with "producers' values" as defined in A System of National Accounts (SNA). "Producers' values" in the SNA refer to the values of commodities at the establishment of the producer including all commodity taxes (such as sales taxes or excise duties) levied on that output. When these commodity taxes are excluded, output, in SNA terminology, is said to be valued at "approximate basic values". The term "producers' prices" as used in this paper may refer to goods valued on either basis - i.e. excluding commodity taxes.

III. SELECTION AND SPECIFICATION OF ITEMS

5. This section describes the procedures by which commodities and items within commodities may be selected for periodic price reporting. For the most part the selection of commodities is discussed without reference to the selection of reportingunits - i.e., the firms, establishments, or enterprises which produce them. This distinction is somewhat artificial since in most cases the choice of commodities to be priced and the identification of respondents are not carried out separately. Logically however, it is clear that two distinct issues are involved, ant that at least conceptually the selection of commodities should precede the choice of reporting units.

A. Selection of commodities

6. The starting point for the selection of the itmes to be priced is the compilation of a list of all commodities produced in the country by establishments engaged in mining, quarrying, and manufacturing. The list should show commodities inasmuch detail as possible and must give the value of output or sales of each goods during a recent year. If possible the list will also give information on the number of producers and where they are located, the growth in sales in recent periods, and the price dispersion or range for each commodity. A census of production covering all industrial

establishments is clearly the most suitable source for such a list. In practice, however, relatively few countries have ever undertaken a comprehensive survey of this kind.

7. An alternative approach in these circumstances is to start with a list of establishments classified by kind of activity and showing total estimated sales or output of each establishment. In most countries establishment lists of this kind will already have been drawn up by the statistical office since they are a basic tool for collecting most kinds of economic statistics. An establishment list gives only indirect and very aggregative information on commodities. It may show for example that there are a certain number of establishments in major group 341 of ISIC - "manufacture of paper and paper products" - but it would not show the large variety of different commodities produced by establishments, including characteristic products ranging from wood pulp and paper board to envelopes and wallpaper, as well as secondary non-characteristic commodities like tar-coated paper or printed cards and stationery. An establishment list willtherefore have to be supplemented by commodity information from other sources. These may include export statistics, information from trade associations, or data on household consumption. Clearly it will also be essential to make direct contracts with at least the larger establishments on the list.

8. When the first stage of the selection process is completed (how the selection is made is discussed shortly) the result should be a list of commodities to be priced, related non-selected commodities, and weights expressed either as money amounts or proportions. Every commodity on the list must be accounted for - that is it must have been chosen as a commodity to be priced, or its weight must have been assigned to a related item selected for pricing. THis stage in the selection process might conclude as in Table 3.1. The 8-digit commodity code shown in this table is used purely for purposes of illustration, and many countries would find it neither feasible nor necessary to use a classification as detailed as this.

Table 3.1 Commodities to be priced

Code	Latest value	Selected for pricing	Value weight
XXXX 66--	500		
661-	240		
6611	100		
6612	80	X	240
6613	60		
662-	60		
6621	25		
6622	35	X	60
663-	200		
6631	55		
6632	8		
6633	7		
6634	125	X	200
6635	5		

9. In this example the simplest possible approach has been taken. One eight digit commodity has been selected to represent each seven digit group. However, it will generally be possible to make the code structure more suitable for price collection purposes. Commodity codes like the ICGS and most national classifications have been established for the collection of production and industry information and may not be well designed for the selection of commodities to be priced in an ongoing monthly or quarterly price survey.

How many price reports per commodity ?

10. In designing the price collection programme the statistician faces the issue of whether to spread the observations over a large number of commodities with each thinly reported or to select a limited number of commodities and collect many observations for each one. The extreme solutions to the problem would be to use the available resources to collect a single observation for every eight digit number of commodity or to collect hundreds of observations for a small number of commodities.

11. Obviously neither of these extremes is to be recommended. The first approach would give acceptable price indices for total manufacturing and maybe the next level of disaggregation but not for individual commodities. The other extreme would produce high quality price indexes for a small number of commodities but would give poor quality estimates at high levels of aggregation. In the first case there is redundancy in the number of commodities collected. In the latter case there is redundancy in the number of observations for the few commodities for which prices are collected. The statistician must select a course within these extremes by a process which minimizes variances within established goals given the resources available for conducting the survey. If all the information on variances of price changes were available the process would be one of meeting target variances for commodities and the various levels of aggregation.

12. Because of limited knowledge about the variance of price-changes, trial and error inevitably plays a part in setting up the price collection programme. However, once the survey has been running for a year or two, the statistician will be in a better position to determine whether more or less observations are needed for particular commodities. If there are six price reports for a given item and all show a very similar price movement the statistician might consider dropping some of them so as to increase the number of price reports for an item which shows greater variation in price changes. 1/

1/ In addition to a simple inspection of the price-data, the technique of step-wise regression can be used to determine whether there is "redundancy" in the price data. A stepwise regression analysis shows how many observations are required to estimate the actually observed price index for a given commodity with a correlation coefficient of 1.0. A description of such an analysis as applied to the U.S. Wholesale Price Index is given in the Wholesale Price Index: Review and Evaluation, op.cit.

Selection of specific items within commodities

13. The next stage in planning the over-all programmes will be to specify within the eight digit code the specific items to be priced. For example, within the commodity "men's shirts", which particular type (size, colour, sleeve-length, material, etc.) is to be selected for pricing ? At this stage a basic strategy issue is encountered. The specification may be drawn up in great detail or it may be prepared on a relatively broad basis. There are advantages and disadvantages in each approach.

14. If the specifications are highly detailed - e.g. men's shirts with collar, long-sleeved, plain white, all cotton, non-shrink, non-crush - the statisticial office may have better control of the process and the collected prices may be sufficiently homogeneous so that actual prices can be published. However, extremely detailed specifications may result in difficulties in collecting price observations since the product may not be made month after month. Furthermore, for some producers a very narrowly specified commodity may be incidental to its production of the eight digit commodity and unrepresentative.

15. A broadly specified commodity on the other hand is more flexible and permits some adaptation to the circumstances of individual respondents. Then reporting arrangements must be made with each enterprise so that sub-specifications within the specifications are determined. One respondent for example, may report for white shirts while another reports for striped shirts, or a firm producing low priced shirts reports their prices while a manufacturer of a high priced line of shirts reports for them. Obviously the statistical office has a more complicated task of controlling the operation because it must ascertain that reporting units continue to price the identical items month after month. A further drawback is that it is not feasible to publish the actual average price in such situations since the prices collected cover a range of specifications within a commodity code.

16. In general, however, the advantages of broad specifications will usually outweigh the disadvantages, and it is probably the superior course for commodities for which it is not intended to publish average prices. It introduces greater flexibility in the programme, probably creates greater representativeness of reported prices and is likely to increase the number of usable observations. Furhtermore establishing the specifications is not a one time operation. The specifications must be continuously reviewed, revised and updated as commodities undergo change.

17. An important question which arises at this stage is how many items each respondent should be asked to report. From an efficiency point of view one would obviously wish to collect as many observations as possible from a firm. Once all the overheads and collection costs are taken into account, collecting and compiling a few more observations adds only marginally to the processing costs. However, public relations and respondent burden must also be considered and some limits imposed. A firm requested to report thirty price observations each month may be unwilling to co-operate but would do so if asked to report seven or eight observations.

18. To avoid imposing too great a reporting burden on respondents while at the same time keeping costs to a minimum it is desirable to set upper and lower limits on the number of price reports from each respondent. A typical rule would be that no respondent is asked to report more than a dozen prices nor less than three. These limits might occasionally be exceeded if particular respondents are exceptionally co-operative or especially unhelpful.

19. For the actual selection of items sampling or non-sampling procedures may be used. These will be considered separately.

Sampling selection of items

20. If random sampling procedures are adopted, the rules should ensure that items over a fixed value of sales or output are selected with certainty, while the remaining products are picked on a random probability basis. In a full sampling structure each commodity selected within a firm for pricing monthly will have a weight associated with it. The weight will be a composite of the probability of selection of the enterprise and the probability of selection of the commodity. The specific item to be priced will be the specification within the commodity.

21. A sampling scheme will require periodic maintenance or updating. This may be needed to identify new enterprises (births) but also for cases where a firm has expanded its production line to new products which should be given a chance of selection. This, of course, must be part of a comprehensive plan so that no bias is permitted to creep into the sampling or estimation structure.

Non-sampling selection of items

22. The advantage of random sampling is that it is an impartial way of selecting the items to be priced, and if a non-sampling approach is used it is important that the selection of items is based on some set of formal rules. These rules should prevent the omission of items merely because it is likely that it will be difficult to collect comparable prices from one period to another, and the rules should also avoid allowing the respondent to have too much influence in the selection process. Even if it is assumed that no harm is intended the potential respondent will be influenced in ways that do not conform with accepted statistical standards. The respondent may suggest the reporting of items for which prices do not change or do not change inordinately. The aim is to choose items which account for a substantial proportion of the respondent's turnover, which have been in production for a reasonably long period (and which are not about to be discontinued in the near future), and which are representative of the bulk of the respondent's output.

IV. SELECTION OF REPORTING UNITS

23. The previous section dealt with the specification of commodities and the selection of particular items for regular price reporting. This section will discuss how the actual respondents should be chosen. The main issues dealt with are the definition of reporting units, the relative merits of sample versus non-sampling selection, and how best to secure the co-operation of prospective respondents.

Identifying the reporting unit

24. There are two parties to every sales transaction and each party will ordinarily have knowledge of the price and other terms of the transaction. It would appear therfore that one might define the rpeorting unit for collecting producers' prices as either the producer or purchaser. Traditionally statisticians have collected price observations from the seller, probably because for each seller there are hundreds or thousands of purchasers. Each producer of textiles for example, may sell to hundreds of apparel and furniture producers and to many wholesalers. Thus, the producer may be thought of as covering many more transactions for the commodity. In areas where discounting and negotiating arise, however, true transaction prices may be easier to collect from purchasers.

25. It would seem difficult to collect prices from the purchaser on a recurring and comprehensive basis since it is unlikely that the kind of refined processing needed to remove purchases from wholesalers, from foreign supplies, etc. will be feasible. There may be some commodities where collecting prices from purchasers is preferable because producers are unable or unwilling to provide real transaction prices, but the recommendation of this manual is that to the extent possible the price observations should be collected from producers.

26. Having decided to collect prices from the producer, it is now necessary to examine the kind of producing unit which should be asked to submit the prices reports. If all producing units are enterprises or firms with one establishment each, no problems arise. The enterprise and the establishment have the same boundaries and if it falls into the survey there is only one possible reporting unit. An enterprise, however, may consist of many establishments and these may be organized within the enterprise in a variety of ways. Standing between the establishment and the enterprise may be legal subsidiaries or division.

27. For our purpose we shall call such intermediate levels of organization divisions. Generally, divisions of an enterprise will have the responsibility of managing the production and sale of groups of commodities. Thus, an enterprise may have a chemical division and a cement division, or a household applicances division and a machinery division. Further, the division may consist of several establishments engaged both in manufacturing and in related kinds of activities such as sales, warehousing or the purchasing of materials. Large enterprises of this type will generally be included in the price surveys, and the question arises as to which organizational unit within the enterprise should be asked to submit the price reports.

28. The statistical office may have no options; the enterprise may insist on some way of reporting. To the extent that the statistician does have the choice, it is clear that reports should be sought from the unit which concludes the sales. In practice this unit will normally be located at the headquarters of the company or division. The establishment of a large multi-establishment enterprise will generally not be a good reporting unit for price information. Within such an enterprise the establishment is frequently treated simply as a production unit and does not have access to all of the latest pricing information. Discounts from a list price may not be known at the establishment level, and where both order prices and

delivery prices are sought they may be known only at the enterprise or division level. While the establishment is probably the best unit for reporting employment, wage payments, quantities produced, energy consumption or other physical measures connected with production, the enterprise or division is the sales and financial centre and is the preferred unit for price reporting.

Selection of reporting units

29. In many countries, there may be only one or two producers for many commodities which have been selected for pricing. This is often the case in small developing countries, because the market cannot support more than one producer using modern mass production techniques. In consequence, it is common to find countries with only one cement factory, textile mill, shoe factory, vehicle assembly plant, cigarette factory, or brewery, and in these circumstances the selection of the commodity automatically involves selection of the reporting unit. Similarly where there are a small number of producers (say 3 or less) price reports should probably be sought from all of them unless market shares are very unequal in which case the smallest producer might be omitted.

30. In what is probably the normal situation however, there will be several producers of the commodities chosen for pricing. In selecting prospective respondents the statistician may choose a sampling or non-sampling approach; these will be separately considered.

Sample selection of units

31. The statistician confronted with any measurement problem must initially consider the possibility of installing a rigorous probability sample. In this context probability sampling means the selection of a sample panel from a universe of reporting units in which each unit has a known chance of selection. In this section some comments on the features of a sample design for measuring price changes in manufacturing and mining are offered.

32. A probability sample permits the measurement of the quality of the survey results through estimates of the variance or sampling error. The quality of results in this context relates only to the chance of a difference between the results obtained from the sampled observations and the result that would have been obtained in a complete enumeration of all reporting units in the universe. The use of a probability sample does not permit the measurement or control of errors arising from non-response, inaccurate reports, obsolete weight proporations, unrepresentativeness of the commodities priced, or any other "non-smpling" source.

33. The first requirement of the sampling process is to define the universe or population and to identify all units in the universe. The universe list must be continously updated by adding new entrants (or "births") early in their lives so that they have a chance of selection. Disposition of "deaths" is automatic. Identification of births must be rigorous and relate only to true births since a mere change of name or reorganization of an existing firm is not to be treated as a birth. In practice, the continous review and updating of the universe list is a costly and difficult business.

34. It is a well known principle of sampling that stratification into segments for which the dispersion of price changes are lower than the over-all dispersion tends to increase the efficiency of the sample by reducing variance. The type of stratification to be undertaken will depend upon the specific circumstances of each country. It may sometimes be desirable to stratify by geographic region or province. Certainly this will always be required in a survey of retail prices. The need is less obvious in the case of manufacturing but may be warranted in some industries where distribution of output is in a limited geographic area and prices may be responsive to cost and demand conditions which are local in character. Producers of dairy products and bread, for example, might be stratified by province or even smaller regions before sample selection of reporting units.

35. The sample design should ensure that all units above a certain size are included. The remaining units should be sampled with probability of selection proportionate to size ("PPS"). This is a well-known technique which is described in most standard texts on sampling. The alternative approach of setting broad strata such as those with value of sales of 1 million to 5 million, 5 million to 10 million, etc., will result in units within each stratum having an equal chance of selection and when selected an equal inflation weight. In a PPS sample design a unit with 5 million of sales will have roughly a five times greater change of selection than a unit with 1 million in sales. Further, the unit falling into the sample on a PPS selection would have an inflation factor inverse to its size, an additional improvement over broad stratum sampling.

Non-sampling selection of units

36. It will often be necessary or even desirable to do without probability sampling. A country may have no practical way of determining the universe in advance, or the cost of installing and administering a proability sample may be judged too high. There are clearly high costs involved in the design, selection process, control and administration of a probability sample for collecting price observations. Furthermore, price indices are in an area of statistics where the risks in not having a probability sample are probably the lowest. This is because the potential diversity of the change in prices charged by various producers of a given commodity over many time periods is relatively low. Stated another way price changes for a given product are more highly correlated than for other variables such as sales, capital expenditures, inventories, etc. Price may be viewed as a function of direct and indirect input cost, profit margin, and productivity and price changes from one period to another may be factored into changes in costs, profit margin and productivity. A number of producers of the same product will be subject to similar changes in costs of direct and indirect inputs, the major component of the change in price. Similarly while one firm may gain an advantage in productivity for short periods this will generally be rectified as new technologies spread or inefficient firms leave the industry. While profit margin and the change in such margins may vary they are a small component of price. Thus the price of a given product which, for several producers, cluster around 100 at a point in time may be expected to cluster around, say, 200 after a number of years. There cannot be wide divergences in the price change for the same product.

37. If a non-sampling approach is decided on, the selection procedure should take account of the way in which the observations for a specified commodity are to be combined. More specifically it should depend on whether each observation is to be weighted by each producer's estimated sales. Consider the following hypothetical distribution of sales of a particular commodity among 8 producers.

Producer	Share of sales
A	.40
B	.30
C	.10
D	.07
E	.06
F	.05
G	.01
H	.01

38. Assume that the complete universe is known and that it has been decided to select 4 reporting units from among the eight. If the four observations are to be averaged without weighting then the best procedure would be to select the 4 largest producers A, B. C, and D. This will ensure that the average price is calculated from the most commonly produced goods. On the other hand, if it is decided to weight the price observations by each producer's sales share, a better procedure would be to select producers A and B plus 2 others from C, D, E and F. Producers G and H would be ignored in a non-sampling approach. They are simply too small and it would be a waste of resources to include them in the survey. The two selected from the 4 middle-sized producers could be assumed to be representative of all producers other than A and B, and the sales shares of the 4 non-selected producers would be distributed between them as weights.

39. However, it will often be the case that the complete universe of producers of the commodity is not known. The larger firms will generally be known and the list of smaller producers will be incomplete. In such cases the safest course to follow will be to collect price observations from the four largest known producers. It is however important in such cases to update lists of producers and identify new producers or small firms that increase their sales volume and become large.

V. PRICE OBSERVATION

40. The following discussion deals with the various conditions of sale relating to transactions for the specified commodity. A series of conditions are discussed and the ways in which the statistical office may proceed are reviewed. The concern is with delivery prices as opposed to order prices: references to a commodity's price in a particular period are to the prices paid for deliveries made in that period and not for orders received during that period (some of which may be for future delivery). It should also be noted that the discussion here proceeds on the assumption that the price observations are being collected from the seller; as mentioned earlier this is the traditional way of collecting data on producers' prices and is the approach recommeded here.

Intra-company transactions

41. In large companies or enterprises there may be a substantial volume of sales between the various production units. Goods produced by one establishment may serve as input for another establishment within the same company. These intra-company transactions, however, may not be recorded in a way that reflects a true price. The transaction may be made in the books of the company at direct costs or at direct plus overhead costs, excluding a profit margin. Or the "price" may be recorded at some nominal amount. There may even be some tax advantage to the firm in valuing the transfer below or even above the probable market price. A term often applied in such situations is that internal transfers may not be recorded at "arms length prices".

42. If the commodities involved in these intra-company transactions are also sold to other firms in reasonable volume, the statistical office may decide to include them in the price survey. It should however be careful to collect only the prices pertaining to sales with external customers; prices relating to intra-company transactions should be avoided.

Class of customer

43. The producer may be selling the commodity to be priced to several different classes of customers such as manufacturers, wholesalers, small retailers, discout stores, construction firms, foreigners, government, or non-profit institutions, and may charge different prices to different classes of customers. In some instances different prices arise because different costs are associated with sales to each class of customer for the identical physical commodity. Or a lower price may be charged to a customer where there is no risk and no delay of receiving payment as compared with some other customer class.

44. The correct procedure in these circumstances is to treat each class of customer separately in collection and tabulation of price indexes. Where the price is different, the price changes may also not be uniform so that muddling prices recorded in, say, sales to retailers and sales to government may yield biased results. Commodities which are physically identical are in effect to be treated as different commodities when they are sold to different classes of customers.

Volume of the sale

45. Even within one class of customer price differences may arise because of the volume of a sale. A purchaser of a very large volume will receive a lower price than does the small volume purchaser. The economic rational for this is that the unit costs for the large volume are lower - i.e., the producer may actually earn the same profit per unit of output on a low price charged on a large-volume sale as with a high price on a small-volume sale. There are many ways in which this might occur. A long production run in some industries is more efficient (less cost per unit) than a short production run, or there may simply be some overhead costs which are fixed per order regardless of the size of the order. Hence the statistician should either treat different sales volumes as different commodities or include the most frequent volume of sale as a specification. In one way or another the reported price observations should not be allowed to change because sales of different volumes are being reported.

Multiple delivery orders

46. Purchase contracts are often drawn up for more than one delivery. For example a steel-mill might order several deliveries of coal over a particular period - say 1000 tons to be delivered each month during the next year and a half: the steel-mill itself may agree to supply a fixed amount of steel of a particular grade each month for the next year. In multiple-delivery orders of this kind the unit - prices usually vary according to the period covered. For a given total quantity the price will usually be lower the shorter the over-all delivery period. Higher prices are charged for multiple delivery orders covering longer periods because suppliers try to cover themselves against possible price rises.

47. The statistician should deal with this situation by collecting prices for orders covering the same or very similar periods. Often there are traditional order periods for particular commodities and these should be identified for each price respondent. The price observations for multiple-deliveries should not be allowed to vary because of differences in the length of the deliver period.

Shipping terms

48. The preferred price to be collected is the valuation of goods as they leave the factory, that is, a price which excludes transportation and any other costs associated with the transportation. This is generally referred to as the ex-factory price. There may, however, be cases where trade practices are such that goods are actually sold on the basis of delivered prices. Where this occurs, the statistician will have no option but to accept such price quotations since the records of the firm will be on that basis and there may be no practical way of excluding transportation costs. Responses must be consistent from one reporting period to the next.

Commodity taxes

49. The items being priced will often be subject to commodity taxes, such as excise duties, sales taxes, or value-added taxes. The statistician will then have to decide whether to collect prices including or excluding these taxes. In practice the statistician may have no choice as to which is to be collected because of the way in which records are maintained. Even where there is a choice available to the statistician the requirements for deflation or analysis in different countries may dictate whether to collect prices including or excluding commodity taxes.

50. What is crucial is that the statistical office know what is being reported for each commodity by each respondent. Where possible, a uniform approach should be taken for all commodities. Where this is not possible, a uniform approach should be taken for each commodity. That is, for certain commodities prices may be collected including taxes and excluding taxes for other commodities. When this occurs the statistical offices should adjust one set or the other by "adding" or

"subtracting" the commodity taxes so that the published results are consistent. As a practical matter this merely requires alertness to changes in commodity tax rates for only then will the detailed indexes and aggregations be changed. In rare instances some producers of a commodity will choose to report with commodity taxes included and others prefer to report with the tax excluded. Assuming that neither group can be persuaded to conform then it will be necessary for the statistical office to adjust the data as appropriate.

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COLLECTION OF PRICES ON BUILDING MATERIALS AND EQUIPMENT GOODS

A Zambian Experience

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Collection of Prices on Building Materials and Equipment Goods - A Zambian Experience

I. Need for Price Statistics

1. The interest in price statistics is widespread. Government agencies, industrial and trading establishments, trade unions, research workers and individual consumers are all interested in price data.

2. Government require up to date price data as a basis for economic analysis. A period of rapidly rising prices will bring undue hardship to the consumers; hence government may wish to enunciate appropriate price control measures. Sudden and sharpfalls in prices of commodities may cause business failures and lead to hardships to builders thus adversely affecting production and employment. Government may like to take preventive action through appropriate price support policies. To decide what action to take and when, reliable price statistics are essential.

3. Industrial and trading establishments plan their purchases and sales depending on the behaviour of market prices. They would like to buy in periods of low prices and sell in times of rising prices. They also wish to know where they can buy goods cheaper. They wish to calculate costs of their material inputs and the profit margins they can make. For these they need basic price data relating to items they buy and sell.

4. Trade union organisations are interested to protect the wages of workers. In periods of rapidly rising prices real wages decline thus making it difficult for the workers to meet their needs. Trade unions wish to enter into negotiations with management for compensating for the price increase. For this they need appropriate price indices.

5. As consumers we are also interested in the prices that we have to pay for various items we buy to meet our daily needs.

6. For all these purposes, it is essential to have up to date and reliable price data.

'Producer Price', 'Wholesale Price' and 'Consumer Price'

7. The price of a commodity varies according to the stage of transaction. The different stages of transaction and the corresponding prices are indicated below.

	Stage of transaction	Price
1.	Manufacturer to Wholesaler	Producer price
2.	Wholesaler to Retailer	Wholesale price
3.	Retailer to Consumer	Consumer price

8. The manufacturer or producer usually sells his produce in bulk to selected agents or wholesalers. The price at which the producer sells is called producer price.

9. The wholesaler sells the commodity in smaller quantities to retail shopkeepers. The price at which he sells is known as the wholesale price.

10. The retailer sells directly to the consumer in individual units or in any possible size or denomination suited to the customer. The price charged by him is known as the retail or consumer price. The consumer (retail) price is usually higher than the wholesale price which is higher than the producer price.

11. It is also possible that sometimes the producer or wholesaler may sell directly to the consumers. The different stages of transaction and the price differentials are important in the study of price levels.

Prices of Individual Commodities

12. It is useful to know the prices of individual commodities at different stages of transaction. There are a large number of commodities which are locally produced and sold or imported and sold. It is indeed difficult to attempt the compilation of the prices of all items sold in urban and rural areas of a country. Collection and dissemination of price data involve considerable effort and resources. Hence price data are collected only for important commodities.

13. Prices quoted by any trading/producing unit for any specific brand/quality of an item are known as 'price quotations'. To understand the price situation in any country numerous price quotations are received. It is difficult to comprehend the movements in a large number of price quotations. The price quotations of any particular item are usually averaged to give an average price for the commodity.

Price Index Numbers

14. Commodity price movements are difficult to comprehend as there are numerous items. To understand the combined effect of price changes, some summary measure is required. The index number is a device which sums up price changes in the various items during any period.

II. Index Numbers of Building Materials and Wholesale Price Index Numbers Compiled by the Central Statistical Office

15. The earliest in the series of quarterly price index numbers of building materials for Zambia was compiled and published by the Central Statistical Office (CSO) with March 1961 = 100 as base. This was revised first in 1968 with base June 30 1966 = 100 and again in 1976 with December 31, 1974 = 100 as the new base period. The series on index numbers of wholesale prices with base 1966 = 100 has been compiled and published by the CSO since 1969. No revisions to date have been made on this series but investigations are going on to find a more recent base period as 1966 base is beginning to show certain deficiencies.

16. The 1968 revision of the 1961 index numbers of building materials series incorporated a number of improvements in respect of coverage of commodities, source of price quotations and method of construction. However, between the two decades of the sixties and seventies, significant changes took place in terms of techniques of construction involving the composition of materials used. As a consequence of these technological developments, some of the materials used in construction had either gone out of use or had become less important while new materials emerged into prominence. These necessitated a revision of the commodity composition and weighting system of the index. In addition opportunity was taken to consider and effect improvements in the following areas:-

a. Coverage of companies from which price quotations were obtained.
b. The basis of allocation of weights for commodities.
c. The need for giving due consideration to the importance of suppliers of materials and
d. The treatment of non-responding units.

17. Similar problems regarding the series of index numbers of wholesale prices exists as outlined above in the case of building materials, as such it may be instructive to look only at problems paused and solutions effected for the compilation of the index number series on building materials.

A. Scope of the Index numbers of building materials and grouping of items

18. The price index of building materials indicates the changes over time of the unit costs of materials used in building construction. The selection of items, selection of suppliers of materials for obtaining price quotations, the grouping of items etc. are dealt with as follows:

Selection of items

19. Considerable attention was devoted to the selection of items for the collection of price data. The list of items included in the 1966 index and the details obtained from an analysis of the statistics of imports of building materials served as the starting point. These were revised on the basis of extensive consultations with major construction companies, the quantity surveying section of the Buildings Branch of the Ministry of Works, the major parastatal organisations and a number of private establishments engaged in building materials trade. Obsolete items were left out while new items were added to the list.

20. The items are classified generally on the basis of the International Standard Industrial Classification. They are grouped by type and according to the nature of price movements. The list of items selected for inclusion in the price index reflects the most commonly used items in Zambia. Special care was taken to include items representative of price movements.

Selection of suppliers of materials

21. The suppliers of materials were selected on the basis of data obtained from various sources, viz:

(a) Registered list of manufacturers: A list of all registered building materials manufacturers is kept by the Industrial Production Division of the CSO. To all these units, a special questionnaire was sent to elicit information relating to the proportion of their products sold to merchants and to construction companies directly. Moreover, information regarding the names and addresses of their major dealers in building materials/customers classified by province together with percentage sales to each of them was obtained.

(b) Register of Building Mineral Permit holders:- The register of building mineral permits gives addresses of companies which have permission to quarry. This provided information for this part of building material supplies.

(c) The lists enclosed with all major Government tenders. The construction companies therein indicate the source from which they intend to obtain their principal building materials.

22. The information contained in the above mentioned sources were used to correct and update the list used for the 1966 index.

Questionnaires for collection of data

23. The questionnaires for the price index of building materials were modified to incorporate all necessary corrections in the items. The existing set of forms were extended to facilitate the distribution of the questionnaires to the suppliers more efficiently. The grouping of commodities, therefore did not completely follow an industrial classification, but at places followed the actual stocking of materials by the suppliers. For instance one usually finds sand, crushed stone and concrete blocks are often supplied by the same company.

24. For small rural suppliers a short list of main commodities was prepared to serve as a base for data collection. The opportunity was also taken to introduce a set of questionnaires which were suitable for direct automatic data processing.

Grouping of items

25. The items are grouped as follows:-

(a) Commodity grouping: This grouping generally followed the "International Standard Industrial Classification of All Economic Activities" (ISIC), United Nations, Series M, No. 4, Rev. 2, Add., on the three digit level.

(b) Provincial grouping: This grouping indicates the price movements of the building materials in each of the 9 administrative provinces of Zambia. However, the Central Province and Lusaka Province had to be grouped together as a large proportion of the requirements of building materials of the Central Province are obtained from Lusaka.

Weighting System

26. The weights were derived on the basis of data gathered from a variety of sources, as no single source of information could provide all the details required for a complete weighting system for the index. The procedures followed for obtaining weights for groups, items, establishments (suppliers) and provinces were:-

(a) Group weights

27. The most important part of the weighting system, the group weights, was derived from the results of the Census of Construction, 1973. The relative importance of each of the twenty seven product groups in the total building materials used was determined on the basis of the data on quantity and value of materials consumed by product group, supplied by the construction companies in response to 1973 Census.

(b) Commodity (item) weights

28. A different procedure was followed for determining the weights of commodities (items) within each group. The suppliers of building materials were requested to provide information on the sales of various items. This information was collected through specially designed questionnaires. In addition, the manufacturers of building materials were also requested to supply details of dealers through whom their products were distributed and the volume and composition of sales to each. The information collected from the above sources together with an analysis of imports of building materials made it possible to determine the relative importance of each of the items for which price quotations were to be collected.

(c) Establishment (unit) weights

29. Respondents to the quarterly price index of building materials were classified by province of location of the establishments. The relative importance of suppliers of a certain item within a province was determined on the basis of data collected through the special questionnaires referred to above. Accordingly a weight was assigned to each of the units within each province.

30. It was assumed that the relative importance of each product within the total was identical for all provinces. This assumption had to be made to facilitate the computation of provincial indices.

(d) Weights for Provinces

31. The relative importance of the construction work done in each of the provinces was obtained from the Census of Construction 1973. Weights were determined on the basis of the value of construction work done in each province. Allowance was made for possible under-estimation of material consumption in the rural areas and for construction activities in the informal sector.

32. The allocation of weights had not been an easy tas . Difficulties were experienced in assigning weights to individual items comprising a group in some cases due to the lack of sufficient basic information. The accuracy of group indices had not been affected by this deficiency as the price movements of

products within a group were identical in a number of cases. In this category may be mentioned items such as steel door and window frames, electrical wiring, reinforcing fabric, reinforcing rods, asbestos cement products etc.

Base Period

33. December 31, 1974 was adopted as the reference base for price comparison. Weights were based on the use pattern of building materials in 1973. As stated earlier, the results of the Census of Construction 1973 have been used to assign weights, supplemented by data specially collected for the purpose.

Steps in Compilation of the Index

34. The overall price index of building materials is obtained after a series of calculations using prices and weights. The steps are outlined below:-

(a) On the basis of the price quotation for each item received from each establishment (reporting unit) price relative is obtained by dividing current price by the price quoted for the previous quarter. (or in case of non-response the last quoted price is used).

(b) The price relative so obtained is then linked to the base period price quoted by the responding unit by chaining it to the index of the previous quarter. This gives a price index for each item for each of the reporting units.

(c) The price indexes for each item for the various reporting units are then combined as a weighted average, weights reflecting the relative importance of each responding unit to the total of all such units. This gives the price index for each item for each province.

(d) The item indices are then combined into group indices as weighted averages, the weights representing the relative share of each item within the specific group. This step gives group indices for different provinces.

(e) The group indices for Zambia are obtained as weighted average of provincial group indices with weights representing the relative importance of each province in the total.

(f) The overall buidling materials price index for Zambia is then obtained as weighted average of the group indices for Zambia, with weights reflecting the relative importance of each group to the total.

35. The group indices for each province (obtained in d) are also combined as a weighted average to arrive at provincial indexes of building material prices. The overall index for Zambia is obtained also as a weighted average of the provincial indexes.

36. Mathematical formulae used for the compilation

Responding unit price indices

Price data for an item from a store (responding unit) at time t = 0, that is, base period is denoted as $P_{(i,s,g,r)_0}$.

Price data for an item from a store (responding unit) at time t, that is, current quarter is denoted as $P_{(i,s,g,r)_t}$.

Price index for each item for each responding unit is given by

$$I_{(i,s,g,r)_t} = \frac{P_{(i,s,g,r)_t}}{P_{(i,s,g,r)_{t-1}}} \cdot X \; I_{(i,s,g,r)_{t-1}}$$

where t-1 refers to the previous quarter.

Notations:

0	base period
t	current quarter
i	item
g	commodity group
s	store
r	province
p	price level
I	index (store-item index)

Weights

$\sum_r W'_{(r)} = 1$	the region weights sum to unity
$\sum_i W''_{(i,g,r)} = 1$	the item weights sum to unity for each group in each region.
$\sum_g W'''_{(g,r)} = 1$	the group weights sum to unity in each region.
$\sum_s W'''_{(i,s,g,r)} = 1$	the store weights sum to unity for each item in each region.

Aggregation

Regional group indices

$$I(g,r) = \frac{\sum_i /W''(i,g,r) \times I(i,g,r)/}{\sum_i W''(i,g,r)}$$

where $\sum_i W''(i,g,r) = 1$ with complete response

National group indices

$$I_N(g) = \frac{\sum_i /W'(r) \times W'''(g,r) \times I(g,r)/}{\sum_r /(W'(r) \times W'''(g,r)/}$$

Regional All items indices

$$I(r) = \frac{\sum_g / W'''(g,r) \times I(g,r)/}{\sum_g W'''(g,r)}$$

where $\sum_g W'''(g,r) = 1$ with complete response

National all items index

$$I_N = \frac{\sum_r / W'(r) \times I(r)/}{\sum_r W'(r)}$$

37. Incomplete response is taken into account at all levels in the formulae given above, as in case of non-response the denominator will be less than unity and the index will be inflated exactly to the extent of non-response.

IV. Conclusion

38. In constructing an index number series on building materials or on equipment goods several problems arise and these in turn dictate the methods and techniques employed in their compilation. Among some important considerations we may site the following:-

Selection of Items

39. Care has to be taken in the selection of items on which price relatives have to be made. One has to first look at the popularity of an item, its permanency and usage on the market, its availability and its sensitivity as a predictor of changes in the market forces. In the Zambian case assistance or expert advise was obtained from all leading authorities in the building industry in deciding finally the items that were included in the index.

Selection of Responding Units

40. The initial step in selection of units of suppliers of building materials or any equipment goods is to obtain a complete frame of sources of supply. In the Zambian example in order to create a complete frame, information on major dealers classified by province was obtained through use of a register of all manufacturers of building materials maintained by the CSO. This was supplemented by use of a register of building mineral permit holders which gave addresses of companies which had permission to quarry as well as the use of lists kept by the Ministry of Works and supply relating to all major Government tenders in which construction companies give sources of principal suppliers of building materials. Further it is worth noting that most suppliers tend to confine their activities to special areas only. Dealers tended to confine their activities to such areas as supply of chemical products only; supply of non-metallic mineral products only; supply of tools and equipment only; supply of timber and other wood products; etc. A choice of establishment for inclusion was made by means of a special questionnaire sent out to find out the proportion of products sold by manufacturers to merchants and directly to construction companies.

Grouping of Items

41. Once a selection of items is made then the next step is to classify them into groups. The basis of grouping used was the "International Standard Industrial Classification of All Economic Activities" (ISIC) of the United Nations at the three digit level. A further sub-classification was made by province according to availability and importance of building materials used.

Weighting System

42. A weighting system in any index numbers series is extremely important in order to bring out the relative importance of any item that is included in the compilation of the series. For Zambia group weights, commodity weights, establishment unit weights and weights for provinces were obtained. Group weights were fixed on the basis of the then latest Census of Industrial Production (1973). Weighting in the case of commodities within each group was determined by a suitable weighing of information from various sources. Suppliers of building materials provided information on sales of various items. In addition manufacturers of building materials provided information on the distribution, volume and composition of sales of items. The above sources together with an analysis of imports of building materials were used in determining the relative importance of items.

43. Establishment unit weights were assigned on the basis of special questionnaire referred to above and through the classification of establishments by province of location. Provincial weights were determined on the basis of relative importance of construction work done in each province as obtained from the 1973 Census of Industrial Production.

Non-Response

44. Non-response problems pause the biggest single challenge to compilers of index numbers. Some causes of non-response include: establishments stopping operations; obselescence of items; new products; irregular supply of items; complex questionnaire forms and general apathy on the part of respondents. In the case of Zambia we have seen that the non-response problem was tackled in two ways, namely:

(a) through use of specialised questionnaires aimed at obtaining information according to the material supplied.

(b) through the adoption of a statistical methodology which took account of loss of information at the commodity, group, establishment and higher levels of aggregation without adverse effect on the index.

Base Period

45. The choice of the base is governed by several factors. When we construct one for the first time the base period is trivially chosen as the earliest period it is possible to compile the index. However a new base period with a revised series is required when (a) levels of industrial activities undergo substantial changes (b) technological changes in the industry take place. Both of these in the Zambian case have been experienced. Note also that the base period can be different for price comparison from that of the weighting system as we have imperically observed for Zambia.

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PRICES IN EXTERNAL TRADE

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PRICES IN EXTERNAL TRADE

I. Introduction

1. External trade statistics play an extremely important role in the administrative and planning processes of most economies. The basic data produced in these statistics consist mainly of quantity, value, provenance, and destination of the internationally traded goods. The relationship between quantity and value is of immediate interest to us because of the latter's dependency on prices. In external trade statistics price is important because it acts as a barometer of the domestic as well as of the international trading position and also plays a very important part in the allocation of resources. The importance of prices even extends into the area of international relations: the various situations of conflict and confrontation, relationships between the poor and the rich countries and negotiations between the suppliers and consumers of raw materials. All these must be mentioned here because they are related to the new international economic order.

2. For the domestic economy, it is imperative that the sectors of the economy with inflationary tendencies be known so that corrective action may be taken in good time. In an interdependent world rising prices in one economy also spread to other economies with unfortunate consequences on liquidities and even on political situations. With this background, and the need to take corrective action in a domain of rising prices, it is necessary to have timely information on price movements in respect of internationally traded goods. The methods used in the measurement of such movements are of great importance since any corrective action to be taken will greatly depend on them. There are several measures in use varying in concept and definition, but the most commonly used are the commodity terms of trade, the income terms of trade and the gross barter terms of trade.

II. Types of Prices

3. The need for the accurate measurement of price changes and the terms of trade has given rise to a great deal of discussion, and analyses of the various types of prices have been attempted, including the following:

(a) Specific commodity prices - These are individual commodity prices and may appear in any of the following forms:

(i) reported f.o.b. (c.i.f.) on the border of the exporting (importing) country;

(ii) auction prices in the main producing or consuming countries, (quantities auctioned are also reported);

(iii) spot prices as reported by the major commodity exchanges;

(iv) posted prices, in the case of exports of petroleum, this is the reference price, i.e., the one used normally in external trade statistics and for assessing tax[1]..

1/ UNCTAD, TD/138/Suppl.1, Long-term changes in terms of trade.

(v) "Revenue per barrel" - a concept which takes into consideration the posted price of petroleum exports and the terms of agreement covering the exploitation of petroleum exports.[1] This is the price concept used by UNCTAD in the compilation of its export trade indexes.

Specific commodity prices are collected and published[2] to show market trends and are also used in the construction of price indexes.

(b) Unit values -- In external trade statistics these are based on the transaction value concept[3] and usually refer to commodities as defined in a standard or national commodity classification. Such classifications may group various commodities with similar attributes into one item of its classification. The unit value is obtained by dividing the quantity of the item imported or exported into the corresponding recorded value.

4. The unit value, as defined, is characterised by wide fluctuations (over time and between shipments of the same period) which may reflect either price changes, the heterogenous nature of the commodity mixture or quality changes. Since the main purpose of the external trade unit value indexes is to measure price changes, the unit value therefore comes out less suited as a price indicator than the specific commodity price. However, the former is readily available as a byproduct of customs statistics while as the latter has to be obtained through special surveys and there are also other additional problems discussed elsewhere in this paper. Consequently, the following section concentrates on the construction of unit value indexes and on how to improve them in the light of the points mentioned above.

III. The construction of unit value indexes

5. The method of compilation used for constructing unit value indexes depends upon the purpose for which they are intended as well as on the nature of the data available. The indexes may be either base weighted or current weighted or constructed in such a manner as to employ both base and current period weights. The characteristics of these indexes and the formulae used have been considered elsewhere[4] so no attempt will be made to examine them here. However, it should be pointed out that the accuracy of the Laspeyre index, which is base weighted is often impaired by the constantly changing structure of external trade. Although the Paasche index provides for this changing structure it suffers from a lack of comparison for non-continuous periods since the numbers must be "members on a continuous scale." Another related issue is the need to "dump down" the effect of the wide fluctuations in unit value which are the result of commodity mixtures or quality changes. Generally the use of the geometric mean of the price relatives of a specific group of similar commodities offers a solution to this problem.

1/ UNCTAD: TD/138/Suppl.1, Long term changes in terms of trade.

2/ International Monetary Fund, International Financial Statistics.

3/ United Nations, Statistical papers, series M.No.52, International Trade Statistics, Concepts and Definitions.

4/ United Nations, Statistical Papers series M.No.59 Guidelines on Principles of a System of Price and Quantity Statistics, Chapter IV.

6. The most serious difficulties in the computation of external trade indexes in developing countries are encountered in the compilation of import trade indexes mainly because of the diverse range of manufactured goods where heterogeneity and quality improvements are the basic requirements for the survival of those goods in external trade. In the rest of this paper, therefore, attention is focussed mainly on import index numbers.

Commodity selection

7. The main concern here is with the selection of those commodities which will be used in the construction of the trade indexes. The selected commodities constitute the sample, and selection for inclusion in the sample depends on such factors as importance of the individual commodity or item, homogeneity, continuity, degree of quantification and commodity specification. These are reviewed individually below:

(a) The importance of the individual commodity in total imports (exports). A threshold point based on value or percentage of total imports may be set for the commodities automatic inclusion in the sample subject to the other requirements being met. In the case of exports only a few easily identifiable commodities may account for a substantial proportion of the total;

(b) Homogeneity within the group from which a set of representative commodities may be selected. For the standard International Trade Classification[5] (SITC) a choice of selection exists, for some commodities at the group, sub-group or item level. In respect of the group and sub-group levels consideration would have to be given to variations in unit value among the member commodities. At the item level the main consideration is unit value fluctuations among the various shipments within a particular period, or within various months for each particular item. Procedures adopted for selection of commodities include the setting of minimum and maximum bands within which the unit value of a commodity may fluctuate before it is selected for inclusion in the sample. The minimum and maximum limits may be set by an arbitrary percentage, a percentage based on the intimate knowledge of the data or by limits set by the standard deviation of a sampling distribution of the unit values or price relatives of the commodity during a specified period. The same limits may also be used for the rejection of a commodity once it has already been included in the index. For an operational index the discarding of unit values on such criteria could result in the rejection of a genuine price changes. Hence it is necessary that in respect of rejected items all shipment or transaction records should be carefully examined.

8. In some cases where neither of the above solutions help, commodities from only one particular country may be selected for inclusion in the sample taking into account the pattern of the direction of trade.

(c) Continuity - only commodities which are imported on a continuing basis and appear in each month's trade should be selected so as to avoid or minimize the problem caused by the disappearance of commodities.

(d) Degree of quantification - only commodities with meaningful quantity units should be included in the sample, those with only the quantity or value specified are excluded.

(e) Commodity specification-- advantage should always be taken of the national commodity classification when it specifies commodities at a finer level of detail than do international commodity classifications from which it may have been derived.

Commodity classification and grouping used in the external trade indexes

9. The commodity classification used for grouping of the external trade indexes is either the one used for the collection of the raw data or an appropriate statistically oriented one (e.g., SITC) that is linked to the former. For exports the grouping adopted may also be based on the major commodity exports. A list of some of the classifications which may be considered for use in the trade indexes - depending on the individual economy are as follows:

(1) The standard international trade classification (SITC). - by section or with similar sections combined (e.g., basic materials would combine sections 2 and 4) or with sections broken up to emphasize the groups;

(2) The custom's co-operation council nomenclature (CCCN)[6/];

(3) The International Standard Industrial Classification of All Economic Activities (ISIC)[7/];

(4) The United Nations Classification by Broad Economic Categories[8/] or an appropriate national end-use classification;

(5) The International Standard Classification of all Goods and Services.[9/]

Generally, decision on the grouping or classification to use also depends on:

(a) The purpose for which the trade indexes are compiled;

(b) The importance of the various commodities or commodity groups in the economy's trade;

6/ Nomenclature for the Classification of Goods in Customs Tariffs, Brussels, January 1972; and Explanatory Notes to the Brussels Nomenclature, Brussels, 1966.

7/ United Nations, Statistical Papers Series M. No.4, Rev.2, International Standard Industrial Classification of All Economic Activities.

8/ United Nations, Statistical Papers Series M. No.53 Classification by Broad Economic Categories.

9/ United Nations, document E/CN.3/493 International Standard Classification of all Goods and services (draft).

(c) Reasons of expediency, the existing commodity classification may be used without any further additional considerations;

(d) In the Guidelines on Principles of a System of Price and Quantity Statistics4/ a point has also been made of the "need to trace changes through the course of production" (P.2) and consequently of the need to relate whatever classifications that are being considered to those that are already in use or have been recommended internationally, with the prime objective of creating an integrated system of price and quantity statistics;

(e) In cases where the main purpose of the trade indexes is the calculation of the terms of trade between imports and exports using the all items index, then considerations of what classifications or groupings should be used in the compilation of the trade indexes do not come into play;

(f) Stratification of the trade into homogeneous commodity groups for proper selection of representative sample members will also considerably influence the commodity grouping or classification.

Weighting

10. Base weights, current weights or a combination of the two are usually used in the compilation of the trade indexes. In the case of the base weights these may either be from a single year or from a group of years. The weighting pattern used is usually in two stages. In discussing this point it is important that a simple but basic distinction be made between fixed item or commodity weights and grouped commodity weights.

(a) Fixed item weights

11. For section indexes the value of the individual commodity constitutes the weight, this being the current value ($P_n Q_n$) or the base value ($P_o Q_o$). The cross valuations ($P_n Q_o$ or $P_o Q_n$) are easily obtained and their summation a fast job on most desk calculators. This operation will produce the section or group index, i.e., the first stage in the computation of the indexes. The second weighting stage for the fixed item weights and the grouped commodity weights are the same, as discussed below.

(b) Grouped commodity weights

12. In indexes of this type weights are assigned to groups of similar commodities or those belonging to the same SITC group. Then only a few commodities, selected to represent the group would be 'priced'. Stage one weighting to obtain the section indexes would be:

$$\frac{\sum \left(\left(\frac{P_n}{P_o} \right)_i W_i \right)}{\sum W_i} = I$$

where $\frac{P_n}{P_o}$ = price relative (either a mean of relative prices or preferably a geometric mean of relative prices).

4/ United Nations. Statistical Papers series M.No.59.

i = a subscript indicating commodity group i

w = commodity group weight (current or base fixed)

I = section unit value index

In the second stage of weighting the procedure is repeated using the section indexes as if they were price relatives:

$$\frac{\sum (I_s W_s)}{\sum W} = I$$

where W = section weight (base or current period)

s = a subscript indicating section

I = all items index

For the fixed item or commodity, the weights and accuracy of the indexes depend almost entirely on what commodities are initially selected. However, for the grouped commodity weights the acouracy and efficiency of the estimates are improved by stratifying on basis of remarks made in the section on commodity classification. The fixed item and the grouped commodity approach may be used jointly.

Coverage

13. The coverage of the indexes besides giving an idea of the group weights is also used as a measure of the reliability of the indexes. Information usually given for each index run to indicate coverage must include the following:

1. Number of commodity items in each SITC or other grouping;
2. Number of commodity items selected for inclusion in the sample;
3. Section or group totals used in the index classifications as a percentage of total imports (exports).
4. Value of sample as percent of total section or group imports (exports);
5. Value of sample as percentage of total imports (exports).

This information is usually published for the base period only, however, in view of the changing structure of trade, it seems desirable to make and publish periodic reviews of the current coverage of the same commodities or commodity groupings as are included in the index sample.

14. The published indexes normally refer, in the case of unit values, only to movements or changes of those commodities included in the sample with the assumption that the movement of the prices of these items represents the movement in the prices of all import (export) items. An adjustment for complete coverage is therefore required for the quantity or quantum index. The methods used by the African countries[10] in adjusting for complete coverage are mainly of two types as follows:

10/ United Nations, ECA document E/CN.14/CAS.10/11, External Trade Statistics Practices

1. "Product of ratio of total value index to value index for selected commodities and corresponding unadjusted quantum index.

2. Product of ratio of percentage coverage in base year to percentage coverage in current year and unadjusted volume index."

These two methods yield identical results. It would appear, therefore, that whichever of the two is used depends to a larger or lesser extent on computational covenience.

15. Finally, the last method used producing a quantum index which is automatically adjusted for coverage is to devide the total value index by the unit value index.

Selection of the base and revision of the indexes

16. The structure and pattern of external trade changes so fast that the trade indexes often become obsolete and no longer give the information they are required to give. The selection of the base year/period therefore needs very careful thought, particularly with regard to the selection of a representative year with respect to an economy's trading and production structure.

17. Examination of the reasons for the frequent revisions to the trade indexes would probably throw light on what factors should be considered in the selection of a base period. Some of these reasons are:

(i) Changing structure and pattern of external trade (e.g., shifts in commodity composition, changes in the relative importance of commodities as well as changes in the direction of trade).

(ii) Changes in commodity classification systems, e.g., from CCCN to SITC or vice versa.

(iii) Political factors - for example changes in national frontiers or economic groupings.

(iv) Changes in the index perspective by the national authorities, i.e., what it is intended to measure, unit value or price changes?

(v) A change in the formula used from either Laspeyre to Paasche or Fishers ideal or some other formula considered as suitable by the preferences of an individual statistician or the dictates of only are user.

(vi) Deliberate need to shift the base of the index to some recent period because the run of the index is more than the required minimum period, say five years.

(vii) Changes in the trade reporting system, for example from f.o.b. to c.i.f., with duty to without duty or from reporting trade flows on a net to a gross basis as was the case in Kenya.

18. Hence it is necessary that, before an index is constructed for national use most of the factors mentioned above must be considered, and the methods of construction discussed fully with all prospective users.

Introduction of new commodities

19. With the passage of time some of the commodities initially included in the compilation of the indexes disappear. In such cases an assumption may be made that no change in price has taken place and the unit value or price relative obtaining at the time of the last observation be used for all subsequent calculations of the indexes. This assumption means that no substitution has taken place and may introduce an upward or downward bias in the trade indexes. In practice the assumption of no change in unit values is the most tempting and easiest to use when the trade indexes are compiled manually and must be available to users by a fixed date, thus allowing no time for further research.

20. A better solution, when resources permit, is to replace the commodity which has disappeared from the country's trade with a close substitute. The method used for introducing new commodities depends on the nature of the raw data and on the formula used in the calculation of the trade indexes. It is harder to introduce new commodities to the fixed item indexes than it is for grouped commodity and current weighted or chained indexes. In general, various methods are used, the problem however, is whether the new commodity incorporates quality improvements over the one which has disappeared. For the trade indexes based on unit value this is not an easy problem, and an assumption may have to be made that all price changes are the result of changes in the relationship between price and quantity.

IV. Comparisons of the various types of indexes of external trade

21. Because of the problems inherent in the construction of reliable indexes for imports, particularly in respect of manufactured goods where the commodities are so heterogenous that it is not possible to obtain a meaningful unit value, a number of attempts have been made in recent years to try and solve some of these problems. One such effort, has been the use of partner country information, in this case exports of the partner country.

22. The advantages of this approach are that greater commodity detail is usually available from the exporting country, and consequently the unit values are likely to be more meaningful as the element of heterogeneity is more or less brought under control. Also, commodity information is obtained mush faster from the exporting country than would otherwise be the case. The Secretariat of UNCTAD have published their indexes on this basis, and in the table below these are compared with nationally compiled indexes, where these are available.

Comparison of the UNCTAD (partner country) and Nationally compiled Import unit value indexes

Country	Index type	Origin	YEAR 1970	1971	1972	1973	1974	1975	1976
EGYPT	P	National	100	109	109	117	218	...	...
	L	UNCTAD	100	107	115	144	219	231	239
KENYA	P	National	100	109	122	145	217	268	290
	L	UNCTAD	100	108	117	144	236	253	266
MALAWI	L	National	100	106	111	129	174	212	243
	L	UNCTAD	100	107	115	142	181	192	196
MAURITIUS	L	National	100	110	120	156	254	287	319
	L	UNCTAD	100	106	114	145	199	209	212
MOROCCO	P	National	100	105	113	128	176	186	185
	L	UNCTAD	100	107	116	145	204	217	224
TUNISIA	L	National	100	103	107	127	176	198	186
	L	UNCTAD	100	107	115	145	227	236	248
UGANDA	F	National	100	107	123	143	204	261	288
	L	UNCTAD	100	107	115	140	191	200	208
UN REP. of TANZANIA	F	National	100	105	131	152	186	295	...
	L	UNCTAD	100	108	117	144	202	218	227
ZAMBIA	F	National	100	105	111	125	160	198	221
	L	UNCTAD	100	108	116	141	182	193	198

Notes: P = Paasche F = Fisher
L = Laspeyre

Sources: (a) National : Foreign Trade Statistics for Africa Series C, No.2 Summary Tables (draft).

(b) UNCTAD: Supplement 1977, Handbook of International Trade and Development Statistics.

23. The UNCTAD indexes differ from the nationally compiled ones and generally have an upward bias for each of the above ten countries because of the following reasons which may not themselves be exhaustive:

(a) The UNCTAD index numbers are of the Laspeyre type with fixed weights and will therefore have an upward bias if compared with national Paasche or Paascherized indexes.

(b) the UNCTAD index numbers for imports utilize unit values derived from US dollar values while as the national indexes are calculated from national currencies, there is therefore an exchange rate bias in the UNCTAD indexes.

(c) the UNCTAD indexes are calculated from partner country f.o.b. data, and although they are not adjusted to include insurance and freight, it is possible that some of the commodities included in the UNCTAD series may never in fact find their way to the expected importing country.

(d) The periods of reference for the UNCTAD and national indexes are not comparable as the data would become available to UNCTAD compilers long before the commodities have even arrived in the reporting country. Consequently the UNCTAD indexes would tend to report price changes for the imports of the African countries much earlier than would otherwise be the case,

(e) The UNCTAD series, for one reason or another, use weights derived from the partner country's export data to the importing country. Hence the national and the UNCTAD indexes use different weights.

24. Some general comments now appear necessary. The approach adopted by UNCTAD has led to the availability of trade index numbers long before national indexes have been compiled, and in some cases to the availability of external trade index numbers even for those countries which do not themselves compile or publish index numbers of external trade. Secondly, the UNCTAD effort is the first detailed examination of an alternate approach for the compilation of index numbers of external trade using partner country data.

25. Having examined the UNCTAD partner country unit value import indexes, attention may now be turned to what are generally termed "specific commodity price indexes" as opposed to the "unit value indexes". The data source for the specific price indexes is normally the importer/exporter of the enterprise. Like the consumer price indexes, each commodity is the described as precisely as possible, and such detailed information as brand name, maker, and various other physical characteristics, considered necessary to ensure that the same type of commodity is priced each time. For these indexes, the trade flows reported in the external trade statistics are used to provide the weights.

26. The main advantage of the specific price indexes is that the problem of commodity heterogeneity is reduced. However, on their own, the specific price indexes raise serious problems among which are the following:

(a) differences in the derivation of the weights and prices - the values in the trade flows represent direct quantity and unit value relationships, while as specific prices bear no relationship to the trade fows.

(b) the basis for both the unit value and the specific price is the contract price, but this may differ from the transaction value of external trade statistics because of adjustments to the latter by customs administrations, and also because of various business practices and exchange control regulations which may not be easy to identify or control.

(c) The period of reference for the specific price may not be identical with the trade flows to which it is supposed to refer.

(d) Most of the intergovernmental and some of the private trade flows contain an element of aid, and hence the specific price may not reflect this aspect of trade flows as does the unit value.

(e) Since each commodity is given very detailed specifications, specific price indexes require a much higher number of commodities for inclusion in the compilation of the indexes and this introduces problems of sampling and selection of price outlet units similar to those of consumer price indexes.

(f) As the compilation of specific price indexes would of necessity entail surveys, then a serious cost constraint that would also affect the accuracy of the results arises.

(g) Finally, it is not evident whether the specific price indexes so compiled would provide a better measure of the terms of trade, or would be more useful for economic analysis than the unit value indexes.

27. What emerges from this brief discussion is that the unit value indexes need to be improved and that the alternative specific price indexes would require further discussion and a lot more resources to compile. A compromise solution that has been adopted in some countries is to supplement unit value indexes with specific pricing for commodities with unwieldly unit value fluctuations, and for commodities with none or poorly defined quantity specifications.

V. Country Practices

28. The recent survey of External Trade Practices[10] revealed that external trade index numbers were compiled for 18 of the 31 countries in respect of which questionnaire returns were received. However, current unit value and quantity indexes are available in respect of only 10 independent African countries.[11] Details on practices are available for even fewer countries. The remarks made in this section therefore may leave out the practices of other countries because the data was not avilable at ECA. The country practices are discussed under the heads (1) Data used and sources; (2) Formula; (3) Commodity selection; (4) Classification and commodity grouping; (5) System of weights; (6) Coverage and (7) Selection of base.

1. Data used and sources

29. Most countries use data on unit values obtained from customs records. Libya[12] supplements this with specific commodity prices where customs records do not have quantities (e.g., forks, spoons and table ware) and Kenya[13] uses specific commodity prices for SITC division 78. In both cases the specific commodity prices are obtained from importers/exporters.

2. Formula

30. The table below extracted from African External Trade Statistics Practices shows the general position in the African region, with respect to the unit value formula used and the associated quantum index.

Association of Unit Value and Volume Indexes in African countries

Volume Indexes / Unit Value Indexes	Laspeyres	Paasche	Fisher "Ideal"	Other	Not computed	TOTAL
	Number of countries					
Laspeyres	3	6	1	-	-	10
Paasche	2	-	-	-	-	2
Fisher "Ideal"	-	-	4	-	-	4
Other	-	-	-	-	1	1
Not computed	-	-	-	-	-	1
TOTAL	6	6	5	1	1	18

10/ ECA document E/CN.14/CAS.10/11

11/ United Nations, Monthly Bulletin of Statistics, March 1979.

12/ Kingdom of Libya, External Trade Indices 1962-1966.

13/ Kenya Government, Kenya Statistical Digest, June 1977 Vol.XV No.2.

3. Commodity selection

31. Libya excludes commodities below the value of LL.1000 as well as those commodities which are not properly defined. Kenya restricts the unit value fluctuation range to 20% or to commodities from a specific country, and Malawi[14] includes only those commodities with stable monthly unit values over the initial base year.

4. Commodity Classification and Grouping

32. Kenya, Zambia, Mauritius and possibly 12 other countries[10] use the SITC and follow the sections for the grouping of the indexes. Libya uses the BEC and Malawi has its own end-use classification. Algeria[15] uses three classifications, namely by degree of manufacture, by broad economic categories and by the system of national accounts - all three for exports and the last two for imports. Tunisia[16] and Morocco[17] use the classification: foodstuffs, energy, raw materials of vegetable origin, raw materials of mineral origin, semi-manufactures and manufactured products, a classification based on the CCCN.

5. System of weights

33. Most countries of the region use current weights for unit value indexes and fixed base weights for volume indexes. Kenya's indexes are "Paascherized" in the sense that section indexes are Laspeyre, but the all items index is computed in such a manner as to take account of the changing structure of trade.

6. Coverage

34. Coverage is generally lower for imports than for exports. The survey of African External Trade Statistics Practices revealed the following:

Coverage of the Import Unit value indexes

Under 50%	50-60%	61-75%	Over 80%
Malawi	Zambia	Gambia	Egypt
		Nigeria	Morocco
		Togo	Sudan
		Kenya, Uganda, Tanzania (formerly EAC[18])	Ghana
			Lesotho
			Madagascar
			Mauritius

14/ Malawi Government, Monthly Statistical Bulletin, Quarterly Supplement, September 1978.

15/ Algeria, Direction des Statistiques, Indices 1967-1970 du Commerce Extérieur (base 100 en 1969).

16/ Tunisia Government, Statistiques du Commerce Extérieur, No.7 Année 1976.

17/ Kingdom of Morocco, Echanges commerciaux du Maroc, Année 1974.

18/ East African Community.

In the case of exports coverage was better and more than 80% for all the countries of the African region which compile indexes of external trade.

35. Algeria reports a coverage of 149 export commodities and 1,549 import commodities in its trade indexes, while as for Kenya the number would seem to be 85 and 178 respectively.

7. Selection of base

36. Algeria used 1969 because it is also the base of the country's 1970-1973 four year development plan. Zambia,[19] on the other hand uses an average of the years 1969-1975 for its base weights for both imports and exports.

VI. Priorities for future work

37. From the above discussion it would appear that the priorities for work in external trade indexes would be:

(a) Consolidation and improvement of the indexes by those countries which are already compiling them.

(b) That those countries which are not yet compiling any trade indexes should start compiling them and technical assistance obtained if necessary.

(c) Countries should give more detail on methodology with their published external trade indexes.

(d) Continued investigation and exchange of experience in the use of specific commodity prices primarily to supplement unit values.

(e) Integration of the external trade indexes into the new system of price and quantity statistics.

Other references used

United Nations ECE, document CES/AC.45/2 Measurement of Price changes in External Trade, particularly for paragraphs 26 and 27.

19/ Government of Zambia, Monthly Digest, Vol. XIV, Nos. 7 to 9 July/September 1978.